NATIONAL VOCATIONAL EDUCATION
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RESEARCH REPORT

Does part-time work at school impact on going to university?

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About the research

Does part-time work at school impact on going to university?

Xiaodong Gong, Rebecca Cassells and Alan Duncan, National Centre for Social and Economic Modelling (NATSEM), University of Canberra

Combining school study with part-time or casual work is an increasing trend for Australian high school students. For some, it is a way of earning some extra cash and having a bit of freedom from their parents, or it is an opportunity to get some experience in an occupation they are interested in. This paper looks at the impact that working while studying has on students' intentions to go to university as well as their actual enrolments.

The authors use data from the Longitudinal Surveys of Australian Youth (LSAY) 1998 cohort to observe the work and study patterns of young people over a period of time. The paper confirms the findings of other research: that students are more likely to combine study and work as they progress through their school years, with over half of students working in Year 12. The study also found that girls are more inclined to combine study and work, but boys tend to work more intensively than girls. Combining some work with study does not change the likelihood of enrolling in university, but working intensively — more than 15 hours per week — does reduce the chances of going to university, especially for girls. This paper adds new detail to what is emerging quite clearly: that some part-time work for full-time students is fine, but long hours do impact on academic progress.

Key messages

- Combining work and study is fluid, with students moving in and out of work throughout the year. While the likelihood of working increases as a student moves further into their education, students do tend to work less intensively in Year 12, perhaps indicating that they regulate their work hours as their study commitments increase.
- The influence of school peers can be seen in students' study and work choices, with students more likely to combine study and work if a higher proportion of their school mates do so. Similarly, peer effects also play a role in students' intentions to go to university and in their likelihood to enrol.

Tom Karmel
Managing Director, NCVER

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Executive summary

With many young Australians entering the labour force while still in school, it is important to understand how these experiences affect individual outcomes. The research presented in this report provides an in-depth understanding of the dynamics of the way Australian students in secondary schools combine study and work and how work patterns influence both their intention to enrol in university and their actual university enrolment. The report looks at how young Australians make their way into the labour market and how these early working experiences affect students' work and study choices.

The report sheds light on the role of peers in influencing pathways towards a university education. By including information about the school environment, such as the proportion of students in the same school who are working and those who intend to go on to university, we are able to test these peer effects.

Our chosen modelling approach captures the essentially dynamic nature of these decision processes and the impacts of both observed and unobserved factors on outcomes. (The model also takes sample attrition into account.) The specification allows us to see whether study and work will affect students' motivation for and the actual outcomes of higher education. We also include terms in the model that capture whether those students who are more or less likely to combine study and work are also intrinsically more or less likely to progress to university. This rich structure facilitates a better understanding of the implications of the study—work choices of students for subsequent education and employment outcomes.

We estimate models of education and work choices separately for boys and girls, using the first five waves of the Longitudinal Surveys of Australian Youth (LSAY) 1998 (Y98) cohort. This enables students' outcomes to be tracked over a five-year period, from Year 9 enrolment, until a year after the completion of secondary school.

Key findings

The following are the main findings to emerge from these analyses.

- Overall, students are more likely to combine study and work as they progress in their schooling years. In Year 9, 79% of students did not work at all, but by Year 12, this had decreased to 44%. However, we also find that combining work and study is not a permanent state, with many students entering and exiting the workforce, as their circumstances dictate.
- A student's choice of working while at school and their chances of enrolling at university are not only driven by characteristics such as ability, socioeconomic background and school environment, but also by the path they take. Their previous choice affects their subsequent school—work decisions and their educational outcomes.
- Addressing the key question in the research project, we find that combining work and study in previous school years does not affect a student's desire to go to university, but it may affect their ability to do so. A key finding from this investigation is that working too many hours while at school is likely to hinder a student's likelihood of going to university, even if the intention to participate is unchanged. We found that those who worked intensively in Year 12 reduced their chance of securing a university position by approximately 11 and 21 percentage points, for boys and girls, respectively.

- Combining some hours of work and study increases the probability of boys' actual enrolment in university by 5.3 percentage points, but does not have a significant effect on girls.
- Peer effects play an important role in students' choices, with the proportion of students intending to go to university at school increasing both the intention for and the likelihood of university enrolment.
- We also find that gender, type of school, ability, geographic location and socioeconomic background significantly affect both the intention for and actual enrolment in university, with the effect being much larger for girls than boys. For example, for a one-percentage-point increase in the proportion of students at school intending to enrol in universities, the probability of enrolling in university would be increased by 0.47 percentage points for boys and 0.85 percentage points for girls.

Introduction

The proportion of school students who start working while still in school has grown substantially in Australia over the past decade. Data from the Longitudinal Surveys of Australian Youth (LSAY) reveal that around 25% of Year 9 students in 1995 and 1998 had part-time jobs, with evidence of a growing trend towards longer working hours during the course of study. A number of motives have been suggested to explain why more students are taking on part-time jobs: to gain experience of working; to achieve a degree of financial independence; or as a job market signal to future employers (Commonwealth of Australia 2009). For a small proportion of students, part-time work provides a necessary contribution to household income. Given such prevalence, it is important to understand the influences that early working experiences have on students' subsequent work and study choices and the impact that working while at school has on labour market outcomes later in life.

Research shows that combining work with high school education (study—work hereafter) can have long-term consequences for an individual's educational attainment and labour market outcomes.[1] A number of Australian studies, most of which are descriptive in nature, analyse the impact of working while studying on students' educational attainment and employment prospects (see for example, Robinson 1996, 1999; Dwyer et al. 1999; Marks, Fleming & McMillan 2000; Vickers, Lamb & Hinkley 2003; Biddle 2007; Polidano & Zakirova 2011). The consistent conclusion throughout these studies is that working while in school is generally beneficial, provided the working time commitment is not too extensive. A recent study by Anlezark and Lim (2011), using the latest available LSAY data, provided an informative description of the prevalence of working while at school in Australia. They examined the impacts of combining school and work on school and post-school study outcomes, with effects differentiated according to students' gender and the extent of work commitments.[2] Their findings indicate a modest negative impact on educational outcomes for those working longer hours. Male students work longer hours than female students on average, with female students better able to combine study and work.

However, at least in Australia, the dynamics of students' study—work choices and the cumulative impact of working while at school on pathways to higher education are far less well understood. Anlezark and Lim (2011), along with a previous study by Biddle (2007), provide a static picture of what is actually a complex and dynamic issue.[3] Students make decisions to combine work and study repeatedly, and previous choices are highly likely to affect subsequent study—work decisions and educational outcomes (often called 'state dependence' by economists). On the one hand, working in Year 9 may affect students' outcomes and confidence in the school environment, which in turn may influence effort and future achievements in school. On the other hand, more income from working and the potential to derive future returns from current labour market experience may motivate students to work longer hours. Capturing the dynamics of the study—work choice will help us to understand the effects, not only of working while at school on future education and employment

[1] See, for example, Meyer and Wise (1982); Cameron and Heckman (1993, 1998); Carr, Wright and Brody (1996); Ruhm (1997); Schoenhals, Tienda and Schneider (1998); and Hotz et al. (2002).

[2] This study uses propensity scores to control for the likelihood of combining school and work in regressions of education and employment outcomes. This is important in that it (partially) controls for the self-selection of students into the group who combine school and work by virtue of their observed characteristics.

[3] Although some previous studies investigate the transition between education and employment, they adopt a reduced-form, static approach, which does not recognise the dynamic nature of the decision process. The implicit assumptions of such an approach are, first, that individuals are myopic about their education and work decisions, and, second, that the accumulated effects of individuals' prior choices (including their earlier decisions to work while at school) are neglected. As such, their decisions in early periods are taken as given when estimating subsequent performance.

outcomes, but also of combining work and study at different times during a student's school career. This will add to the evidence base by which to assess the role and impact of policies and labour market regulations relating to student employment.

In this paper we develop a joint model of secondary school students' study—work decisions and enrolment in universities, using advanced panel data methods specifically designed to capture the dynamic aspects of these decision processes.[4] Study—work choices and transitions are considered among three states — study only; study with some work (fewer than 15 hours per week[5]); and study with more intensive work (15 hours or more per week) — and modelled to vary with individual characteristics, family backgrounds and school environments. The dynamic aspects of the process are captured by relating students' current study—work choices to their work state in the previous year, and by allowing for intrinsic correlations between unobserved preferences.[6] Intentions to study at university and actual enrolment are modelled in a similar fashion. In addition, we also include terms in the model that allow us to test whether those students who are more or less likely to combine study and work are also intrinsically more or less likely to progress to university.[7] These specifications provide an indication of whether the combination of study and work will affect students' motivation to progress to higher education in the future, as well as their subsequent enrolment outcomes.

Biddle (2007) conjectures that peer effects may play an important role in determining students' preferences for working while at school. We test this hypothesis formally and look in addition at the role of peer effects in shaping students' intentions to progress to higher education.

The data used in our analysis are drawn from the 1998 LSAY cohort (Y98 cohort), in which a nationally representative sample of about 14 000 Year 9 students in 1998 is tracked annually for up to 12 years. The longitudinal nature of LSAY allows a dynamic analysis of student choice. As our focus is on study—work choice and on receiving higher education, we use the first five waves of the sample; that is, until a year after the students leave secondary school.[8] One drawback of the survey is its high attrition rate over time, and we take account of the potential impact of such attrition using advanced statistical controls. For more details of LSAY, see NCVER (2009).

The remainder of the paper is organised as follows. In the next chapter, we discuss the data in more detail and provide some initial descriptive analysis of patterns of working while at school. In the following chapter we develop a dynamic model of study—work choice to identify those factors that most strongly influence students' decisions to combine education with part-time jobs. Models are estimated for female and male students separately in order to examine whether study—work patterns and drivers vary by gender. We also look at gender differences in the influence of peer effects on enrolment intentions and future employment/education outcomes, with the following chapter presenting a series of simulations that quantify the changes in study—work choices driven by increased peer participation in part-time work. The report ends with some conclusions.

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[4] In particular, we develop a multi-equation dynamic panel data model, in which students' study—work decisions and intention to and actual enrolment in university are modelled jointly, with full controls for students' unobserved characteristics (see appendix A for technical details).

[5] The threshold of 15 hours per week is ad hoc, but equates to an average of three hours per day in each school week.

[6] The basic dynamic setting of the model is similar to those in, for example, Cameron and Heckman (1993, 1998) and Hotz et al. (2002), and to models applied in other contexts such as labour market mobility (e.g. Maloney 1999; Gong, van Soest & Villagomez 2004), or the dynamics of unionisation (Vella & Verbeek 1999).

[7] This we achieve by allowing the terms capturing unobserved factors in study—work decisions and educational choices to be correlated. Technical details are provided in appendix A.

[8] In this analysis, those who secured a position in universities but deferred their actual enrolments (e.g. those who take a 'gap year') are included. However, decisions to enrol in universities at later stages by some students are ignored.

Data and initial analysis

The 1998 LSAY tracks a large cohort of Australian students entering Year 9 in 1998 over the course of their school careers. The survey collects detailed information on students' education and training choices and employment outcomes, and covers a wide range of school and post-school topics, including: student achievement, student aspirations, school retention, social background and development, attitudes to school, work experiences and post-school career intentions. Given that our focus is on the dynamics of combining study with work and the relationship between study—work choices and higher education outcomes, we use the first five waves of the LSAY sample, covering the period from Year 9 enrolment of the 1998 cohort to a year beyond their exit from secondary school.

Of the 14 117 Year 9 students surveyed in 1998, we removed seven students who were recorded as being in Year 10; 1185 students who had a disability condition (and thus were less able to work); 213 students who moved home or interstate; 209 observations with missing size of residential location; 50 observations in rural Australian Capital Territory and Northern Territory; 353 students who were in apprenticeship or trainee programs in the third and fourth waves of LSAY (Year 11 and 12, respectively); 498 students whose birth years were missing or too large/small to be true; 561 students whose working status could not be identified, and another 337 observations with missing information on test scores, self-evaluation of performance, gender, and language spoken. This left a final sample for analysis of 37 884 observations on 10 704 individual students.

Study and work choices – a descriptive analysis

In each wave, students are asked about whether they do paid work and if they do, the number of hours per week. From this question, we create the study—work variables: study only, if they do not work; some work, if their weekly hours of work are between 0 and 14; and intensively, if their weekly hours of work are 15 or more. In figure 1, we plot the proportion of students who combine study and work from Year 9 to Year 12. The figure shows that, in Year 9, the majority of students (about 79%) did not combine study and work. Of those who combined study and work, most students worked fewer than 15 hours per week. But as they progressed over the school years, the proportion of students not doing any work decreased to about 44% in Year 12, while more of the working students worked intensively. The proportion of students combining study and some work increased to about 37%. In addition, the proportion of students working 15 hours or more per week also increased from less than 3% in Year 9 to about 19% in Year 12. The patterns are different for boys and girls. Boys work intensively more often than girls (see the left panels in tables 7A and 7B).

Figure 1 Patterns of combining study and work

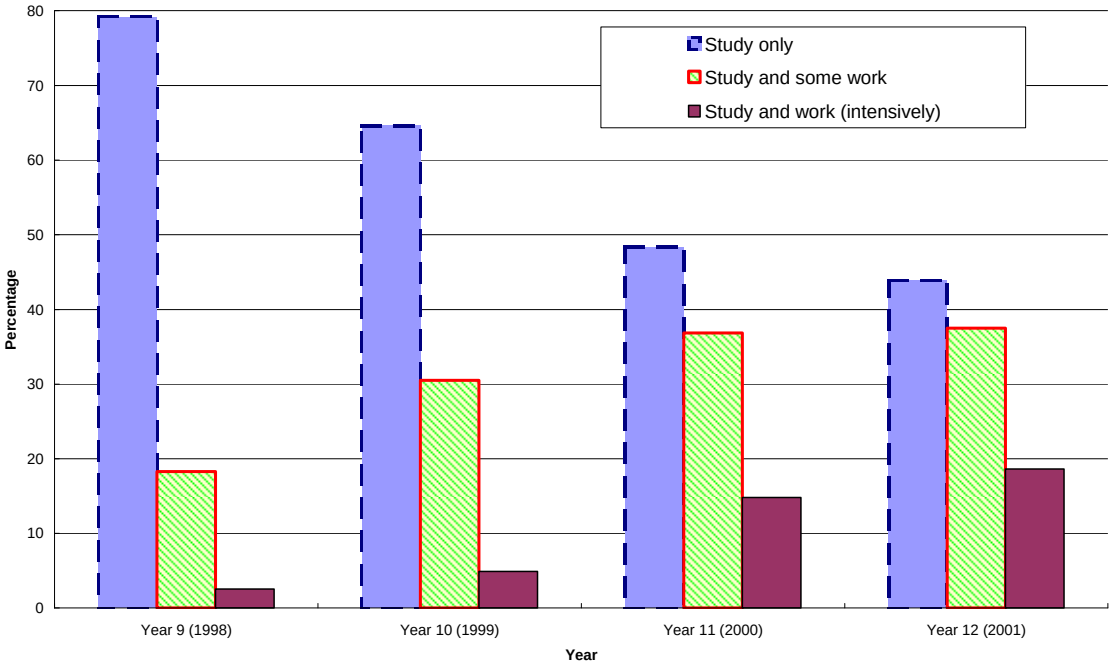


Table 1 describes the transition patterns across different study—work states over five years of schooling from Year 9 to Year 12. The first point to note is that the mobility between different study—work states is quite substantial. Around 20% of students go from not working in Year 9 to working in Year 10. And 24% of students go from not working in Year 10 to working in Year 11. Fewer students reduce than increase their work effort over the course of these two years. Around 7% of Year 9 students reduce their work effort when moving into Year 10, with 10% of Year 10 students working fewer hours (or not working at all) as they move to Year 11.

The picture is somewhat different during the last years of schooling. Although more Year 12 students are likely to combine school with work (56%) than in earlier years, a greater proportion (13%) either reduce working or stop doing so altogether. Although about 28% of non-working Year 11 (2000) students started working in Year 12 (2001), around 18%[9] of working Year 11 students stopped in Year 12. The factors that drive the choice to combine work and school are explored in further detail in the empirical modelling section of this report.

[9] Non-working Year 11 students who began work in Year 12, comprise the sum of 8.78% and 4.83% as a proportion of the total student population who did 'no work' in Year 11 — 48.32%. Of those students working in Year 11, 7.16% and 2.03% stopped work in Year 12, which is 18% of the total non-working student population (51.68%) in Year 12.

Table 1 Transition patterns of study and work (%)

Year t-1		**Year t**		
		t = 1999 (Year 10)		
t-1 = 1998 (Year 9)	No work	Some work (<14 hours)	Work intensively (>15 hours)	Total in *t-1*
No work	59.25	17.12	2.79	**79.16**
Some work (<15 hours)	5.51	11.35	1.42	**18.29**
Work intensively (>14 hours)	0.70	1.17	0.68	**2.55**
Total in *t* (= 1999)	**65.46**	**29.64**	**4.90**	**100.00**
		t = 2000 (Year 11)		
t-1 = 1999 (Year 10)	No work	Some work (<14 hours)	Work intensively (>15 hours)	Total in *t-1*
No work	41.07	17.14	6.36	**64.57**
Some work (<15 hours)	6.89	18.09	5.53	**30.51**
Work intensively (>14 hours)	0.90	1.84	2.18	**4.92**
Total in *t* (= 2000)	**48.86**	**37.07**	**14.07**	**100.00**
		t = 2001 (Year 12)		
t-1 = 2000 (Year 11)	No work	Some work (<14 hours)	Work intensively (>15 hours)	Total in *t-1*
No work	34.70	8.78	4.83	**48.32**
Some work (<15 hours)	7.16	24.94	4.76	**36.85**
Work intensively (>14 hours)	2.03	3.77	9.03	**14.83**
Total in *t* (= 2001)	**43.89**	**37.49**	**18.62**	**100.00**

Notes: Based upon individuals observed in two consecutive waves.
Source: Authors' calculation based upon LSAY 1998.

Intention for, and enrolment in, university

The key educational choices and outcomes we focus on in this project are, first, the intention of the student to progress to higher education post-school, and, second, whether the student actually enrolled in a higher education institution (or received an offer) after Year 12. Table 2 summarises the post-school education choices of those Year 9 (1998) students. Specifically, we look at the proportion of Year 9 students in LSAY expressing their desire to enrol in a university course who subsequently obtained a university place (either enrolled or in receipt of an offer) in the year after their graduation from Year 12. Table 2 shows that 56% of Year 9 students intended to study at university, around 70% (or 39.27 out of 56.04%) of whom succeeded in securing a university place (equating to 39% of all students). On the other hand, less than 27% (or 11.72 out of 43.96%) of those Year 9 students who said they didn't intend to study in a university were observed subsequently to enrol or secure an offer in 2002. These overall patterns are repeated when comparing the enrolment intentions and outcomes of students as they progress beyond Year 9. This shows that the intention to enrol is a good (but by no means perfect) predictor of the actual enrolment outcome, with some students quite uncertain about their post-school education choices and others not able to make the desired transition to university.

Tables 2A and 2B reveal some interesting enrolment patterns differentiated by the students' gender. Data show that girls are more likely than boys to aspire to higher education and more likely to be offered a university place. The results indicate that around 62% of female students in Year 9 expressed their desire for a place in higher education, compared with less than 50% of boys. In 2002, 56% of girls secured a university place, compared with only 46% of boys.

Table 2 University study intentions and enrolment outcomes (%)

Expressed intention to enrol at university (1998)	Enrolled in or offered enrolment in university in 2002 (post-Year 12)		
	No	Yes	Total
No	32.24	11.72	**43.96**
Yes	16.78	39.27	**56.04**
Total	**49.02**	**50.98**	**100.00**

Table 2A University study intentions and enrolment outcomes (boys) (%)

Expressed intention to enrol at university (1998)	Enrolled in or offered enrolment in university in 2002 (post-Year 12)		
	No	Yes	Total
No	38.06	12.35	**50.40**
Yes	16.31	33.29	**49.60**
Total	**54.37**	**45.63**	**100.00**

Table 2B University study intentions and enrolment outcomes (girls) (%)

Expressed intention to enrol at university (1998)	Enrolled in or offered enrolment in university in 2002 (post-Year 12)		
	No	Yes	Total
No	26.89	11.14	**38.02**
Yes	17.20	44.77	**61.98**
Total	**44.09**	**55.91**	**100.00**

Notes to all tables: Based upon individuals observed in two consecutive years and excluding observations with missing hours.
Source: Authors' calculation based upon LSAY 1998.

Characteristics of students, their families and schools

LSAY includes information on each student's individual and family background, the attributes of the school in which they study, their ranking scores in a test during their first interview,[10] and a self-assessment of their own ability, performance and attitude. These variables will almost certainly impact upon their educational choices and outcomes. In addition we believe that the school and local environments, especially the behaviour and attitudes of their peers, will influence students' own education and work choices. By exploiting the school identifiers available in LSAY, supplemented by information on the students' residence and school type (if they changed school), we have been able to construct a range of variables that reflect the school environment, including the proportion of students: who intend to study in a university; who combine study and work; who perform better than average; or who have positive reflections on their own school experience (see table 3B).

For students who changed school during Years 11 or 12, there is no identifier in the LSAY data for their new school. This prevents the construction of specific school environment variables for use in our empirical modelling. In such cases we use as proxies the average value of each environment indicator in the student's local area, as well as a direct indicator to control for the change of school. Descriptive statistics for the data used in this analysis are presented in tables 3A and 3B.

[10] Students were asked to complete two tests on literacy and numeracy when they were first contacted in 1998. From their answers in these two tests, a standardised (to mean zero and standard deviation of 1) measure of achievement in literacy and numeracy were produced. In the data, however, only a categorical variable (quartiles of achievement) of this measure is available. For more details, see NCVER (2009).

Included in table 3A are variables that describe the students' own circumstances and their families' characteristics. We use their own and their parents' birthplaces, language and years since arriving in Australia to proxy their cultural and ethnic background. We also use students' test scores and their self-assessed measures of ability, and year and state dummies to control for local labour market patterns and institutional conditions. The student's family background (as measured by their parents' background) is also likely to affect study—work and higher education choices. While most students were born in Australia or other English-speaking countries (about 93%), many have quite different backgrounds. For example, about 14% of the students have both parents born in non-English speaking countries and about 10% of students speak a language other than English at home.

Measures of self-assessment are used together with the actual test scores as proxies for students' ability because they may capture additional information about confidence, attitude and potential that can't be reflected by a single ability index.

Table 3A Sample statistics – students' individual and family characteristics

Variables	Mean
Boys	.503
Born in Australia/NZ and other English-speaking countries	.928
Born in non-English European/Latin American countries	.016
Born in other countries	.056
Residence: metropolitan	.606
Residence: regional	.220
Residence: rural or remote	.174
Indigenous	.028
Arrived in Australia during high school	.018
Arrived in Australia during primary school	.044
Arrived in Australia before primary school	.032
Test score in 1998 above average	.513
Self-assessment in 1999: English above average	.465
Self-assessment in 1999: maths above average	.465
Language at home: English	.904
Language at home: European	.034
Language at home: Asian	.040
Language at home: other	.018
NSW	.251
Vic.	.212
Qld	.214
SA	.088
WA	.117
Tas.	.053
NT	.029
ACT	.036
Neither father nor mother born in English speaking countries	.143
Father finish Year 12 and with qualification	.440
Mother finish Year 12 and with qualification	.427

Source: Authors' calculation based upon LSAY 1998.

One of the purposes of this project is to investigate whether and how the attitudes and behaviours of peers impact on students' choices. A number of scenarios serve to illustrate the importance of peer effects in modelling student choice. First, peer pressure that increases the likelihood of a student working may be greater in schools with a greater proportion of students combining study and work.

Likewise, students in schools where a high proportion of their peers have the intention of pursuing higher education may be more likely to adopt this course themselves. In table 3B we present a number of constructed variables that describe the school environment, including student test scores, self-reported school assessment of the school and parents' demographic characteristics. These variables are constructed by taking the school average of the corresponding values reported by individual students.

Table 3B Sample statistics – school environment, 1998 (Year 9)

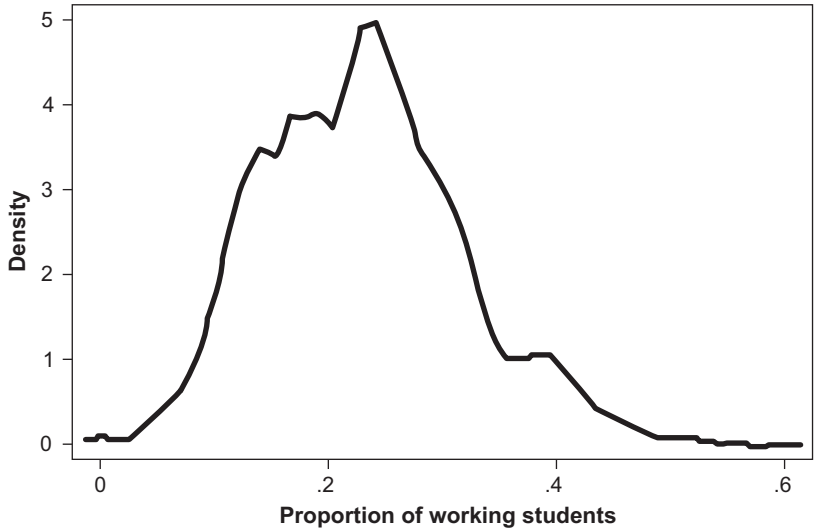
Variables	Mean (std)
Proportions of students in school in 1998 (excluding self):	
who are working	.231 (.09)
with test scores above average	.503 (.19)
who intend to study in a university	.497 (.19)
whose father finished Year 12 and with qualification	.469 (.18)
whose mother finished Year 12 and with qualification	.449 (.16)
who finish homework	.282 (.12)
who believe their school friends are eager to learn	.611 (.13)
who believe their school friends work hard	.629 (.14)
who believe their school friends are well behaved	.563 (.16)
who believe their teachers are qualified	.691 (.15)
School type in 1998: government	.623
School type in 1998: Catholic	.227
School type in 1998: independent	.150

Notes: Based upon individuals observed in two consecutive years.
Source: Authors' calculation based upon LSAY 1998.

The spread of school environment factors (as shown by the standard deviations on each indicator in table 3B) suggests that school environments vary considerably from one school to the next. We illustrate this by showing the estimated distributions[11] of the proportion of working students in schools (figure 2) and the proportion of students in each school with above-average test scores (in figure 3). Although around 23% of students combine school and work in an average school, the distribution of the proportion of working students in each school covers a fairly broad range. Figure 3 tells a similar story for the average performance of students in each school. One element of variation is likely to be the type of school: LSAY data reveal that around 62% of students were in government schools, 23% in Catholic schools and the remainder in independent schools (table 3B).

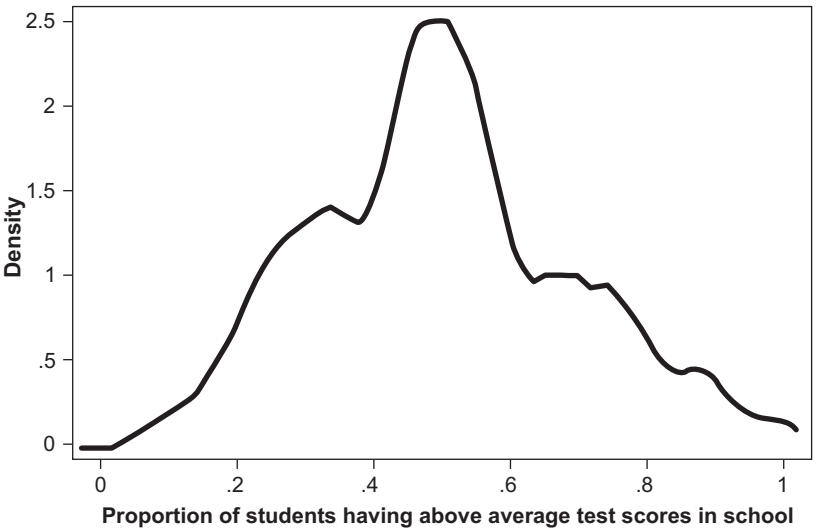
[11] The distributions are estimated using non-parametric techniques.

Figure 2 Estimated proportion of working students in schools



Note: Kernel = epanechnikov; bandwidth = 0.0124.

Figure 3 Estimated proportion of students with above average test scores



Note: Kernel = epanechnikov; bandwidth = 0.0272.

Modelling study–work choices: approach

Approach

In this section we summarise briefly the model used to examine young Australians' patterns of working while at school. Further and more technical details of the model specification and estimation methods are provided in appendix A.

Our model consists of four equations in three parts: study—work choices; intention and actual enrolment in higher education; and attrition. The four-equation model is estimated separately for boys and girls.

Study—work choices of students in secondary schools

We distinguish three alternative states of study—work for a secondary school student in each year. Specifically, a student *i* at time *t* (= 1998, 1999, 2000, and 2001) is modelled to choose from the following three alternatives:

$$y_{it} = \begin{cases} 1.\ \text{Study only;} \\ 2.\ \text{Study and some work } (< 15 \text{ hours per week}); \\ 3.\ \text{Study and work intensively } (\geq 15 \text{ hours per week}). \end{cases} \quad (1)$$

To explain the study—work choices of students and to capture the most important drivers of this decision, we specify a dynamic choice model, including a series of controls for both observed and unobserved characteristics. A student's decision to work and study in any one school year is likely to be conditioned directly by their study—work status in previous years (a phenomenon known as 'state dependence' in economic models of individual choice). Our empirical model is specified in a way that accommodates this form of dependence over time.

Students' intention and enrolment in higher education

We examine the self-reported intentions of secondary school students to enrol in higher education, and their actual enrolment, to better understand the most important drivers and influences of educational choices and outcomes. The particular purpose of our approach is to capture the dynamic elements of students' educational choice and especially the relationship between study—work choices and enrolment intentions/outcomes. This link is established by including prior study—work choices in an empirical model of enrolment on the grounds that previous study—work decisions may affect preferences for tertiary education by altering students' labour market experiences and impacting upon their achievements and educational outcomes while at school.

Sample attrition

One issue with LSAY is its high attrition rate over time. For example, around one-third of the students interviewed in 1998 were not interviewed in 1999 (by telephone). By the fifth wave of the sample (corresponding to 2002, one year beyond Year 12), only 44% of the original cohort of students

remained in the sample. For most LSAY waves, students exit the survey permanently. However, this wasn't the case for the third LSAY wave (2000, Year 11). For this wave, some students who were missing from the 1999 telephone interview returned mailed-out questionnaires by post. As a result, the proportion of original students remaining in the sample for that year was roughly the same as in 1999. As is well known, non-random attrition in panels can adversely affect the reliability of the analysis. We account for attrition by modelling the conditional probability of remaining in the panel sample in each LSAY year as a function of student and family characteristics and use this 'survival' probability to adjust the empirical estimates of study—work and enrolment choices (see Horst, Nijman & Verbeek 2001).

Modelling study–work choices: estimation results

In this chapter we discuss in detail the estimated results from our model of study—work and enrolment patterns for Australian students. The structure of the model is summarised in the previous section and described in more detail in appendix A. To examine whether gender differences emerge in the most important drivers of choice, we estimate separate models of study—work choices and enrolment intentions/outcomes for boys and girls.

For all models, our results are presented in the form of 'marginal effects', whereby the impacts of drivers of study—work choices are expressed in the form of probability differences relative to the 'average' student. So, for example, in table 4 the likelihood of an Indigenous boy working some hours while at school is 11.1 percentage points lower than for a non-Indigenous boy, with all other factors held at their average values. Of course, this is a *marginal* effect, and other circumstances do also have a significant impact on study—work choices. In combination, these different factors will generate overall propensities for work and study that differ significantly between Indigenous and non-Indigenous children. A description of the calculation of marginal effects in this report is provided in appendix A.

Students' decisions to work while at school

Not surprisingly, socioeconomic and ethnic backgrounds are important for students' study—work choices. For example, parents' education appears to be an important factor for students' study—work decisions. Compared with students whose fathers have finished Year 12 and with post-school qualifications, students' with fathers receiving lower education tend to be more likely to work longer hours. Students from Asian backgrounds are less likely to combine study with work, relative to the 'average' student. A similar result emerges for Indigenous students, although these lower effects are likely to be for different reasons for the two groups of children. Compared with government schools, students in Catholic or independent schools are less likely to engage in work. Looking at the intensity of working, students in Catholic schools are less likely to work long hours than those in other schools.

Students' actual test scores in 1998 and their self-assessed performance in mathematics and English (used as proxies for ability) are influential to the study—work choice. Students with above-average test scores and those who assess themselves to be above average in English or mathematics are less likely to engage in long hours of work while at school. However, ability measures don't seem to show such a strong correlation with part-time work. An obvious explanation for this result is one of specialisation, whereby students with higher academic abilities devote more time to their studies than less academically able students.

We find that peer effects play an important role in students' study—work choices, particularly the prevalence among the school cohort of combining work with study. Table 4 shows that, if the proportion of working students in a school increases by one percentage point,[12] the likelihood of combining study with some work for a boy (girl) would increase by 0.61 (0.67) percentage points, and

[12] The sign of the coefficients for the percentage of not working students is negative, so a decrease of non-working students is the same as an increase of working students.

of working intensively by between 0.06 (0.08) percentage points. These results illustrate the importance of the school environment in shaping students' behaviour and performance.

An important finding from our research is that students' study—work choices are persistent over time, in the sense that current study—work choices are significantly affected by previous work decisions (table 4). These can be seen from the marginal effects of the variable for previous year study—work choice (marked in bold in table 4 and subsequent tables). For illustration, if a boy with an 'average' set of characteristics and circumstances worked intensively in a year, his probability of working intensively would increase by four percentage points a year later, and that of combining study and some work would increase by 27 percentage points. Doing some work while studying would also increase his chance of continuing to do so a year later by 39 percentage points, but wouldn't increase his chance of working intensively.

Lastly but importantly, we find the student's unobserved characteristics to be significant and important when explaining their choices and outcomes. Unobserved characteristics between the level of employment in the study—work equations are shown to be positively correlated, but negatively correlated with those in the intention and enrolment equations. These results (presented in table B7 of the appendix) suggest that students who combine study with some work are similar to those who work longer hours, but are different from those who study only, and those who intend to go to university.

Gender differences in study–work choices

This research has shown up some important and systematic gender differences between boys and girls in their patterns of study and work and the factors that most influence their study—work choices.

The first strong difference to emerge is in the extent of working while at school. Boys, when they are in Year 12, are substantially more likely than girls to work intensively while at school, and less likely to combine study with some work (as shown by the simulation results in tables 7A and 7B). Asian and Arabic girls are respectively 21 percentage points and 25 percentage points less likely to combine study with some work than the reference female student. Asian and Arabic boys also have a lower likelihood of working while at school than their comparator peer group, but the difference is much less marked.

The educational background of the father is regarded as a key indicator of the socioeconomic status of the family, and results from table 4 show there to be significant differences in patterns of study—work according to the father's education. Boys are seven percentage points less likely to combine study with work if their father has no educational qualifications, compared with those whose fathers received a qualification and Year 12 certificate. The same effect is not shown so strongly for girls.

To what extent is working while at school a behaviour that persists over time? As discussed above, our model captures the propensity to continue with study—work choices over time by looking at the associations between previous work histories and current study and work choices. Interestingly, there is a stronger 'state dependence' for girls working intensively while at school when compared with boys. This indicates that those girls who do work longer hours are more likely to continue to do so over the course of their school career than boys. State dependence is generally stronger for students who combine study with some part-time work than those who worked intensively, but stronger for boys than girls.

Table 4 Marginal effects on probabilities of study–work (dynamic)[13]

Variables	Boys				Girls			
	Some work		Intensively		Some work		Intensively	
Indigenous	-.111*	(1.74)	.002	(0.26)	-.165**	(2.42)	-.012	(0.58)
Born later than 1984	-.104	(0.14)	.002	(0.02)	-.313	(0.61)	-.018	(0.10)
Regional Australia	-.010	(0.43)	.000	(0.02)	.007	(0.35)	-.011	(1.63)
Rural Australia	-.002	(0.07)	-.004	(1.27)	-.021	(1.03)	-.007	(1.06)
Catholic school	.029	(1.31)	-.003	(1.04)	.016	(0.78)	-.014**	(1.96)
Independent school	-.021	(0.73)	.005	(1.27)	-.067**	(2.61)	-.022	(2.03)
Born: non-Eng. Europe/L. America	-.065	(0.63)	-.006	(0.44)	.069	(0.75)	-.046	(1.15)
Born: other non-Eng. countries	-.057	(0.75)	-.007	(0.57)	-.013	(0.22)	.013	(0.58)
Parents born in non-Eng. country	-.112**	(2.98)	-.010	(1.57)	-.077**	(2.43)	-.025*	(1.87)
Father: no qual. or Year 12	-.074**	(2.21)	.006	(1.62)	.008	(0.29)	.015*	(1.89)
Father: qual., no Year 12	-.016	(0.67)	.013**	(3.16)	.046**	(2.30)	.020**	(3.10)
Father: Year 12, no qual.	.003	(0.08)	.005	(0.96)	-.060*	(1.80)	.010	(0.97)
Father: educ. missing	-.048	(0.65)	-.004	(0.57)	-.054	(1.17)	.005	(0.36)
Mother: no qual. or Year 12	-.026	(0.82)	-.001	(0.33)	.023	(0.97)	.003	(0.48)
Mother: qual., no Year 12	-.026	(0.76)	.003	(0.61)	.039	(1.24)	.001	(0.09)
Mother: Year 12, no qual.	-.017	(0.59)	-.002	(0.50)	.036	(1.55)	-.008	(0.98)
Mother: educ. missing	.008	(0.10)	.015*	(1.87)	.031	(0.55)	.013	(0.88)
Migrated after primary sch.	-.113	(0.85)	.001	(0.04)	-.164	(1.58)	.052	(1.54)
Migrated during primary sch.	-.004	(0.06)	-.002	(0.23)	-.058	(0.98)	-.005	(0.24)
Migrated before school	.043	(0.61)	.002	(0.20)	-.081	(1.42)	-.012	(0.60)
LOTE: European	-.003	(0.06)	.008	(0.96)	-.051	(0.97)	.022	(1.28)
LOTE: Asian	-.153**	(2.20)	-.012	(1.07)	-.213**	(3.35)	-.037	(1.34)
LOTE: Arab	-.129	(1.11)	.009	(0.55)	-.254	(1.46)	.011	(0.21)
LOTE: other	-.266	(0.88)	.025	(0.95)	-.038	(0.22)	.024	(0.35)
Self-assessed: Eng. above average	.033*	(1.82)	-.007**	(2.12)	.021	(1.34)	-.010*	(1.71)
Self-assessed: maths above average	-.007	(0.38)	-.009**	(2.30)	.042**	(2.74)	-.013**	(2.01)
Same school as in 1998	-.052*	(1.78)	-.005	(1.55)	-.008	(0.33)	-.006	(0.79)
1998 test score above average	-.011	(0.54)	-.011**	(3.15)	.021	(1.29)	-.013**	(2.45)
Proportion of students not working	-.673**	(9.35)	-.063**	(3.27)	-.607**	(8.50)	-.078**	(2.95)
Proportion of students above average test score	-.025	(0.37)	.000	(0.02)	-.033	(0.58)	-.012	(0.60)
Proportion of students intending to go to university	.167**	(2.54)	-.044**	(3.03)	.124**	(2.22)	-.080**	(3.24)
Work intensively in previous year	.266**	(6.54)	.041**	(2.84)	.213**	(5.14)	.098**	(3.67)
Some work in previous year	.388**	(13.85)	-.001	(0.21)	.350**	(15.5)	.021**	(2.12)
State dummies	Yes							

Notes: * Significant at 10% level; ** Significant at 5% level; t-values are in the brackets. The reference group is study only. LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Enrolment intentions and outcomes

The results in tables 5 and 6 suggest a clear association between students' enrolment intentions and their parents' educational background. Students in families where the father has fewer educational qualifications are less likely to express an intention to go to university and are less likely to secure a

[13] In this table (and in tables 5, 6, and B1—B6), the reference dummies include: non-Indigenous Australians; students born before 1985; students living in urban Australia; students in government schools; students born in English speaking countries; parents born in English countries; father/mother with qualification and Year 12 certificates; non-migrants; speaking English at home; test scores/self-assessment not above averages; not in the same school as in 1998; and not working in the previous year.

university place than those whose fathers have post-school qualifications. There are a variety of explanations for the relationship between parents' educational attainment and students' own choices. On the one hand, the need for students to work to either contribute to household income or supplement their own pocket money may be less in families with more highly educated parents. Parental role model effects are also likely, with the students of more educated parents having different attitudes towards study and work, and a more positive disposition towards higher education.

As expected, students' actual test scores in 1998 and their self-assessed performance in mathematics and English are strong predictors of their intention to progress to higher education, as well as actual enrolment. Specifically, students with above-average scores or an above-average self-assessment of abilities in English and mathematics are more likely to enrol in university beyond Year 12. This finding is true for both boys and girls.

Peer effects are estimated to play an important role in students' education choices and outcomes, with enrolment intentions and outcomes being positively influenced by the positive disposition towards higher education among the larger student cohort in a school.

There is no evidence that a student's intention to go to university is affected by their choice to combine study with work while at school (as evidenced by the insignificant effects of the two study—work variables in the intention equation presented in table 5). However, the propensity for actual enrolment in university does seem to be affected (table 6). For the 'average' male student, his chance of securing a place in a university would be reduced by about 11 percentage points if he works long hours in Year 12. For girls, this negative effect is almost doubled (21 percentage points). On the other hand, the likelihood of enrolling in a university is generally not affected for students who combine study with only some work during Year 12. These findings are consistent with previous studies both in Australia and internationally (see for example, Meyer & Wise 1982; Hotz et al. 2002; Vickers, Lamb & Hinkley 2003; Biddle 2007; Anlezark & Lim 2011).

For the 'average' male student, a one-percentage-point increase in the proportion of school peers intending to go to university would lead to an increase of 0.9 percentage points in his own intention to enrol in higher education. The chance of realising this ambition would also increase, by 0.5 percentage points. Interestingly, peer effects appear to be stronger for girls than boys. Our estimates suggest that Year 9 girls are 1.2 percentage points more likely to want to enrol in university for every increase of one percentage point in the proportion of their school peers who intend to go on to higher education. Girls are also more likely to convert this intention to reality, with actual enrolment rising by 0.8 percentage points.

Table 5 Marginal effects on probabilities of enrolment intention (dynamic)

Variables	Boys		Girls	
Indigenous	-.127	(1.34)	-.064	(0.60)
Born later than 1984	-.001	(0.00)	.518	(0.82)
Regional Australia	.032	(0.97)	.005	(0.14)
Rural Australia	.018	(0.52)	.076*	(1.95)
Catholic school	.064**	(1.97)	.067	(1.96)
Independent school	-.004	(0.09)	.052	(1.15)
Born in non-English country in Europe/Latin America	-.100	(0.72)	.204	(1.28)
Born in other non-English countries	.012	(0.11)	.027	(0.24)
Both parents born in a non-English country	.189**	(3.28)	.302**	(4.61)
Father's education: no qualification or Year 12	-.137**	(2.50)	-.149**	(2.91)
Father's education: qualification, no Year 12	-.137**	(3.38)	-.119**	(3.42)
Father's education: no qualification, but Year 12	.053	(1.07)	-.002	(0.03)
Father's education: missing	-.134	(1.31)	-.278**	(3.65)
Mother's education: no qualification or Year 12	-.073	(1.50)	-.066	(1.48)
Mother's education: qualification, no Year 12	-.165**	(2.87)	-.086	(1.46)
Mother's education: no qualification, but Year 12	-.016	(0.39)	.078*	(1.90)
Mother's education: missing	-.216*	(1.84)	.020	(0.22)
Migrants: arrival high school or later	-.055	(0.31)	-.013	(0.07)
Migrants: arrival during primary school	.077	(0.84)	-.019	(0.19)
Migrants: arrival before school	-.038	(0.37)	.071	(0.67)
LOTE: European	-.012	(0.15)	-.200*	(1.95)
LOTE: Asian	.314**	(2.83)	.311**	(2.58)
LOTE: Arab	.169	(1.15)	-.101	(0.47)
LOTE: other	.095	(0.28)	.144	(0.52)
Self-assessment: English above average	.239**	(5.91)	.295**	(0.44)
Self-assessment: maths above average	.213**	(6.06)	.220**	(7.67)
Same school as in 1998	-.022	(0.75)	.053	(1.51)
1998 test score above average	.331**	(5.34)	.280**	(8.92)
Proportion of students not working	.145*	(1.87)	.006	(0.08)
Proportion of students above-average test score	-.030	(0.32)	-.063	(0.54)
Proportion of students intending to go to university	.859**	(5.57)	1.207**	(12.59)
Proportion of fathers with qual. and Year 12	.222	(1.61)	-.344**	(2.26)
Proportion of mothers with qual. and Year 12	.036	(0.25)	.334**	(2.10)
Proportion of students finish homework	-.267**	(2.22)	-.105	(0.85)
Proportion of students think mates eager to learn	.066	(0.50)	-.079	(0.52)
Proportion of students think mates working hard	.092	(0.66)	-.007	(0.04)
Proportion of students think mates well behaved	-.208*	(1.66)	-.039	(0.29)
Proportion of students think teachers qualified	.123	(1.00)	-.170	(1.40)
Work intensively in previous year	-.047	(1.11)	-.039	(0.83)
Some work in previous year	.030	(1.23)	-.009	(0.36)
State dummies	Yes			

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the brackets.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Table 6 Marginal effects on probabilities of actual enrolment

Variables	Boys		Girls	
Indigenous	-.218*	(1.92)	-.242	(1.21)
Born later than 1984	-.066	(0.17)	.826	(0.18)
Regional Australia	.020	(0.56)	.024	(0.44)
Rural Australia	.085**	(2.11)	.162**	(2.68)
Catholic school	.049	(1.37)	.105*	(1.94)
Independent school	.028	(0.60)	.034	(0.47)
Born in non-English country in Europe/Latin America	-.050	(0.37)	-.139	(0.62)
Born in other non-English countries	.115	(1.02)	-.096	(0.62)
Both parents born in a non-English country	.143**	(2.23)	.220**	(2.37)
Father's education: no qualification or Year 12	-.154**	(2.20)	-.245**	(3.20)
Father's education: qualification, no Year 12	-.103**	(2.13)	-.130**	(2.49)
Father's education: no qualification, but Year 12	-.028	(0.56)	-.133	(1.48)
Father's education: missing	-.236*	(1.91)	-.265**	(2.19)
Mother's education: no qualification or Year 12	-.083	(1.50)	-.093	(1.41)
Mother's education: qualification, no Year 12	-.090	(1.51)	-.086	(0.99)
Mother's education: no qualification, but Year 12	.028	(0.78)	.087	(1.45)
Mother's education: missing	-.059	(0.49)	-.070	(0.48)
Migrants: arrival high school or later	.059	(0.26)	-.107	(0.49)
Migrants: arrival during primary school	-.115	(1.16)	.204	(1.38)
Migrants: arrival before school	-.193*	(1.68)	.161	(1.13)
LOTE: European	.004	(0.05)	-.158	(0.98)
LOTE: Asian	.149	(1.45)	.177	(1.21)
LOTE: Arab	-.019	(0.14)	-.466	(1.53)
LOTE: other	.042	(0.25)	-.001	(0.00)
Self-assessment: English above average	.197**	(3.55)	.313**	(7.28)
Self-assessment: maths above average	.217**	(3.67)	.366**	(8.13)
Same school as in 1998	-.079**	(2.58)	.041	(0.78)
1998 test score above average	.309**	(3.24)	.423**	(8.30)
Proportion of students not working	.038	(0.37)	-.111	(0.71)
Proportion of students above average test score	.131	(1.16)	.033	(0.17)
Proportion of students intending to go to university	.467**	(2.82)	.847**	(4.93)
Proportion of fathers having qual. and Year 12	.081	(0.49)	.158	(0.63)
Proportion of mothers having qual. and Year 12	.412*	(1.96)	.393	(1.50)
Proportion of students finishing homework	.001	(0.01)	-.303	(1.48)
Proportion of students think mates eager to learn	.269	(1.51)	.260	(1.03)
Proportion of students think mates working hard	.126	(0.79)	-.160	(0.65)
Proportion of students think mates well behaved	-.264*	(1.69)	.055	(0.25)
Proportion of students think teachers qualified	.073	(0.54)	.093	(0.44)
Work intensively in previous year	-.112**	(2.20)	-.209**	(3.12)
Some work in previous year	.054*	(1.64)	.025	(0.60)
State dummies	Yes			

Notes: * Significant at 10% level; ** Significant at 5% level; t-values are in the brackets.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Simulations

With model estimates, the probabilities of study—work choices, educational intentions and outcomes can be computed for given values of observed and unobserved characteristics. We use simulations to assess how well the model is able to reproduce the data and to analyse the dynamic patterns of these choices.

Simulated sample probabilities

Simulated aggregated probabilities produced by the model are calculated by aggregating the probabilities for all individuals in the sample with simulated values of the unobserved characteristics, and are then compared with the actual probabilities in the data. This is to assess the extent to which the model fits the data. Tables 7A and 7B present the results for study—work patterns, and table 8 for intention and enrolment in university. In tables 7A and 7B, both state probabilities for each wave and cross-tabulation of each pair of two consecutive waves are produced. The two tables show that the model predictions of the state probabilities are close to the actual data (with the differences for most of them less than one percentage point). The predicted cross-tabulation between the first two waves also follows the data reasonably well, but it exhibits larger discrepancy with the actual data for later waves. As discussed in Gong, van Soest and Villagomez (2004), it would be unreasonable to expect a perfect fit.

Table 7A Simulated and actual average study and work probabilities (boys)

	Actual				**Simulated**			
		Cross-tab.				Cross-tab.		
	Size	*No work*	*Some*	*Intensive*	*Size*	*No work*	*Some*	*Intensive*
Wave 1 to 2								
No work	.779	.781	.187	.033	.770 (.01)	.741 (.01)	.210 (.01)	.049 (.01)
Some	.191	.362	.572	.066	.200 (.01)	.467 (.03)	.486 (.02)	.047 (.01)
Intensive	.030	.340	.440	.220	.030 (.02)	.487 (.03)	.337 (.03)	.176 (.02)
Waves 2 to 3								
No work	.678	.670	.217	.114	.674 (.01)	.609 (.01)	.232 (.01)	.159 (.01)
Some	.277	.256	.551	.193	.274 (.01)	.352 (.02)	.502 (.02)	.146 (.01)
Intensive	.046	.200	.288	.512	.053 (.01)	.321 (.03)	.284 (.03)	.396 (.03)
Waves 3 to 4								
No work	.527	.722	.158	.120	.528 (.01)	.586 (.02)	.230 (.01)	.184 (.01)
Some	.311	.209	.635	.156	.308 (.01)	.336 (.02)	.495 (.02)	.169 (.01)
Intensive	.162	.123	.195	.682	.164 (.01)	.297 (.03)	.268 (.02)	.435 (.03)
Total	**1.00**	**.465**	**.313**	**.222**	**1.00**	**.467 (.01)**	**.312 (.01)**	**.222 (.01)**

Notes: Standard errors are in parentheses.
Source: Authors' calculation based upon LSAY 1998.

Table 7B Simulated and actual average study and work probabilities (girls)

	Actual				Simulated			
		Cross-tab.				Cross-tab.		
	Size	*No work*	*Some*	*Intensive*	*Size*	*No work*	*Some*	*Intensive*
Waves 1 to 2								
No work	.802	.721	.241	.038	.805 (.02)	.681 (.01)	.274 (.01)	.045 (.01)
Some	.176	.244	.667	.089	.172 (.01)	.374 (.03)	.557 (.02)	.069 (.01)
Intensive	.022	.193	.482	.325	.023 (.02)	.390 (.04)	.397 (.03)	.213 (.03)
Waves 2 to 3								
No work	.618	.604	.312	.084	.621 (.01)	.542 (.01)	.345 (.01)	.113 (.01)
Some	.330	.204	.623	.172	.325 (.01)	.256 (.02)	.598 (.02)	.146 (.01)
Intensive	.052	.171	.439	.390	.054 (.01)	.245 (.03)	.380 (.03)	.375 (.03)
Waves 3 to 4								
No work	.442	.715	.208	.078	.443 (.01)	.573 (.02)	.328 (.02)	.099 (.01)
Some	.422	.184	.705	.111	.419 (.01)	.284 (.01)	.586 (.01)	.131 (.01)
Intensive	.136	.152	.319	.529	.138 (.01)	.277 (.03)	.379 (.02)	.344 (.02)
Total	**1.00**	**.415**	**.433**	**.153**	**1.00**	**.415 (.01)**	**.432 (.01)**	**.153 (.01)**

Notes: Standard errors are in parentheses.
Source: Authors' calculation based upon LSAY 1998.

Table 8 Simulated and actual average probabilities of intention to universities

	Intention to enrol in a university				Enrolment
	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Boys					
Actual	.441	.435	.498	.485	.456
Simulated	.450 (.01)	.414 (.01)	.501 (.01)	.474 (.01)	.437 (.01)
Girls					
Actual	.575	.533	.604	.610	.559
Simulated	.577 (.01)	.519 (.01)	.609 (.01)	.596 (.01)	.543 (.01)

Notes: Standard errors are in parentheses.
Source: Authors' calculation based upon LSAY 1998.

Simulated probabilities for benchmark students

We calculated state and transition probabilities of study—work for two benchmark boys and two benchmark girl students. The students are non-Indigenous Australian-born English-speaking students who live in urban New South Wales, go to a typical government school (with average values of school variables), with both parents having post-school qualifications and Year 12 certificates, self-assessed to be below average in maths and English and with below-average test scores in the 1998 test. The difference between the two boys (and the two girls) is that one of them is in a school with 20% more working students than the other, who is in an average school. Their unobserved characteristics are also set to their mean values (zero). The standard errors of the predicted probabilities are bootstrapped by repeating the predictions for 100 draws from the asymptotic distribution of the parameter estimates.

Simulated state and transition probabilities of study—work are presented in tables 9A and 9B and 10A and 10B. A few points are important to make. First of all, the students tend to remain in the same study—work state once they are there (except for the state of working intensively in Year 9). This can be seen from the fact that the conditional probabilities of remaining in the same state are mostly the largest compared with the probabilities of moving out of the state. The students are very mobile, switching among the three study—work states. Secondly, over time, combining some work and study

becomes an increasingly popular state that students do not only tend to move into but also where they tend to remain. This can be seen from the increase in the probability of remaining in that state.

The mobility patterns of the two boys (also girls) are also quite different. The boy in a school with more peers working began with higher probability of working (about seven percentage points), and the gap becomes even larger in Year 12 (about ten percentage points higher) than their counterparts in the average schools. Their probability of working intensively in Year 12 is also about four percentage points larger than their counterparts in the average school. These results again illustrate the importance of peer effects for students making study—work choices.

Table 9A Predicted transition probabilities of study–work for a benchmark student (boys)

	Prob(y_t)	**Prob(y_{t+1})**	**Prob(y_{t+1}|y_t)**		
y_t			Study only	Some work	Work intensively
t = 1					
Study only	.824 (.04)	.744 (.04)	.801 (.03)	.167 (.03)	.032 (.01)
Some work	.167 (.04)	.222 (.04)	.474 (.06)	.486 (.06)	.040 (.01)
Work intensively	.010 (.01)	.034 (.01)	.494 (.07)	.335 (.05)	.171 (.04)
t = 2					
Study only	.744 (.04)	.558 (.06)	.642 (.05)	.208 (.03)	.149 (.03)
Some work	.222 (.04)	.278 (.04)	.324 (.05)	.517 (.05)	.160 (.03)
Work intensively	.034 (.01)	.164 (.03)	.244 (.05)	.257 (.04)	.498 (.06)
t = 3					
Study only	.558 (.06)	.465 (.06)	.616 (.05)	.207 (.03)	.177 (.04)
Some work	.278 (.04)	.296 (.04)	.306 (.04)	.508 (.05)	.186 (.04)
Work intensively	.164 (.03)	.239 (.05)	.217 (.05)	.237 (.04)	.545 (.06)

Table 9B Predicted transition probabilities of study–work for a benchmark student but in a school with 20% more students working (boys)

	Prob(y_t)	**Prob(y_{t+1})**	**Prob(y_{t+1}|y_t)**		
y_t			Study only	Some work	Work intensively
t = 1					
Study only	.751 (.05)	.643 (.05)	.730 (.04)	.222 (.04)	.048 (.01)
Some work	.233 (.05)	.306 (.05)	.379 (.06)	.568 (.06)	.053 (.01)
Work intensively	.016 (.02)	.052 (.01)	.390 (.07)	.286 (.05)	.224 (.05)
t = 2					
Study only	.643 (.05)	.454 (.06)	.566 (.05)	.243 (.04)	.191 (.04)
Some work	.306 (.05)	.338 (.05)	.262 (.04)	.551 (.05)	.187 (.04)
Work intensively	.052 (.01)	.209 (.04)	.187 (.04)	.260 (.04)	.553 (.06)
t = 3					
Study only	.454 (.06)	.367 (.06)	.545 (.05)	.226 (.03)	.219 (.04)
Some work	.338 (.05)	.338 (.05)	.251 (.04)	.536 (.05)	.214 (.04)
Work intensively	.209 (.04)	.295 (.06)	.169 (.04)	.238 (.04)	.594 (.06)

Table 10A Predicted transition probabilities of study–work for a benchmark student (girls)

	Prob(y_t)	Prob(y_{t+1})	Prob($y_{t+1}|y_t$)		
y_t			Study only	Some work	Work intensively
t = 1					
Study only	.795 (.04)	.673 (.04)	.747 (.03)	.215 (.03)	.037 (.01)
Some work	.157 (.03)	.275 (.04)	.381 (.05)	.547 (.05)	.073 (.02)
Work intensively	.047 (.02)	.052 (.01)	.388 (.06)	.374 (.05)	.239 (.05)
t = 2					
Study only	.673 (.04)	.469 (.05)	.586 (.04)	.296 (.03)	.117 (.02)
Some work	.275 (.04)	.378 (.04)	.234 (.04)	.588 (.04)	.179 (.03)
Work intensively	.052 (.01)	.153 (.03)	.194 (.04)	.328 (.04)	.478 (.06)
t = 3					
Study only	.469 (.05)	.430 (.05)	.628 (.04)	.275 (.03)	.097 (.02)
Some work	.378 (.04)	.399 (.04)	.265 (.03)	.579 (.04)	.156 (.03)
Work intensively	.153 (.03)	.171 (.04)	.229 (.04)	.336 (.05)	.435 (.06)

Table 10B Predicted transition probabilities of study–work for a benchmark student but in a school with 20% more students working (girls)

	Prob(y_t)	Prob(y_{t+1})	Prob($y_{t+1}|y_t$)		
y_t			Study only	Some work	Work intensively
t = 1					
Study only	.744 (.05)	.573 (.05)	.668 (.04)	.281 (.04)	.051 (.01)
Some work	.193 (.04)	.356 (.04)	.295 (.05)	.620 (.05)	.085 (.02)
Work intensively	.063 (.05)	.072 (.02)	.299 (.06)	.422 (.05)	.279 (.05)
t = 2					
Study only	.573 (.05)	.372 (.05)	.515 (.04)	.344 (.04)	.140 (.03)
Some work	.356 (.04)	.442 (.04)	.186 (.03)	.620 (.04)	.193 (.03)
Work intensively	.072 (.02)	.185 (.04)	.152 (.03)	.340 (.05)	.508 (.06)
t = 3					
Study only	.372 (.05)	.341 (.05)	.565 (.04)	.320 (.04)	.115 (.03)
Some work	.442 (.04)	.455 (.05)	.218 (.03)	.613 (.04)	.169 (.03)
Work intensively	.185 (.04)	.204 (.04)	.185 (.04)	.351 (.04)	.464 (.06)

Conclusions

In this report we have studied the dynamic process of study—work and its interaction with the intention and outcomes of receiving higher education for students in secondary schools in Australia. With a dynamic econometric model that controls for the unobserved characteristics of the students, we confirm that a student's study—work choice and their chance of enrolling in universities are not only determined by their observed and unobserved characteristics such as ability, socioeconomic backgrounds and school environments but also to a large extent by the path they take. Their previous choice affects their subsequent school—work decision and their educational outcomes. Our results confirm previous findings in the literature that working too much at school may have negative effects on educational outcomes. In particular, we found that working long hours significantly negatively affects the probability of enrolling in universities although it has no significant effect on such intentions. This finding suggests that working too many hours while at school may hinder a student's chance of realising their dream to go to university, even though it may not affect that intention. The insignificant effect of working while in school on students' university enrolment intention shows that preference for tertiary education is not much affected by study—work activities but more by their own background and characteristics. Students who are working intensively are also more likely to be boys and from a lower socioeconomic background (as proxied by the father's educational attainment). It is therefore necessary to ask the question of whether those working intensively are doing so out of necessity to supplement individual and/or household income, or whether there are other reasons influencing these findings. Intensively combining work and study (especially for those students who are obliged to participate in the paid labour force out of necessity) raises questions of the adequacy of income and educational support for students in these families.

We studied students' mobility patterns of study—work choices and found that mobility among different states is quite large. Students increasingly engage in working activities as they progress in secondary school, but most of them choose to combine some work with study at some point. Engaging in working long hours seems to be a temporary state, in that many of them switch out of that state a period later.

We found that peer effects are very important for both study—work choices and their educational choices. For example, students in schools with more peers working are also more likely to do so. Students with more peers intending to go to university are also more likely to do so and to enrol in university after Year 12. These findings are hardly surprising, but they may have important implications for policies related to school locations, enrolment and even community design. Peer effects have motivated initiatives in the United States such as the Harlem Children's Zone and the 'No Excuses Charter' schools. For example, the goal of the Harlem Children's Zone is 'to create a "tipping point" in the neighbourhood so that children are surrounded by an enriching environment of college-oriented peers and supportive adults, a counterweight to "the street" and a toxic popular culture that contributes to anti-social behaviour'.[14]

The father's education is shown to have an impact on students' study—work patterns and enrolment intentions. It has been shown that the father's educational attainment acts as a proxy measure for the family's socioeconomic status, or the socioeconomic background of an individual. This is because fathers are usually the primary breadwinner, and education and occupation have strong associations

[14] <http://www.hcz.org>, viewed 13 April 2012.

with income and, consequently, standard of living. This measure has been widely used and supported in various studies (see for example OECD 2010; d'Addio 2007).

Using this as a measure of family background allows us to see how different the outcomes are for people who come from low socioeconomic backgrounds from those from high socioeconomic backgrounds. However, it does not allow us to quantify exactly how much this matters. But we can draw tentative inferences from this.

Our findings related to gender have provided some important insights with the potential to aid policy design and implementation. The propensity for men to have lower aspirations towards intention to study at university, which is reflected in their significantly lower likelihood of enrolment, may be of concern, but the result is unsurprising, as men are more likely to enter into trades. However, the division between genders in terms of educational attainment is apparent throughout the duration of school and in developmental milestones, with girls more often than not achieving higher average scores in standard tests. Programs that encourage young men to aspire to university and those which aid greater academic achievement when in school could help to bridge these gaps.

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Appendix A: Model specification

Study—work choice of students in secondary schools

To explain the study—work choices, we specify a dynamic multinomial logit panel data equation with random effects. This is similar to the first-order Markov model proposed in Heckman (1981b). In this model, the inclusion of the lagged choice dummies and the random effects to the explanatory variables makes it possible to distinguish between the structural state dependence and unobserved heterogeneity. The individual effects are assumed to be multivariate normal (also with those in equations of students' intention and enrolment to higher education) and independent of the observed characteristics.

Throughout the paper, we assume that each secondary student can choose any of the three study—work alternatives: study only (j = 1); working some hours while study (< 15 hours per week, j = 2); and working intensively while study (j = 3). To each alternative j (j = 1, …, 3) in t>1, attaches a value of utility which is determined by

$$U_{it}^{j} = \sum_{s=2}^{J} \eta_{s}^{j} D_{t-1}^{s} + \beta_{j} X_{it} + \alpha_{i}^{j} + \varepsilon_{it}^{j} \qquad (2)$$

where each D_{t-1}^{s} represents an indicator of the lagged work choices of students at time t-1 for working some hours (s = 2) and for working intensively (s = 3) relative to study only as the reference state. The variables X_{it} denote a range of factors thought to influence students' study—work choices, including individual characteristics, family background variables, past test scores, and information on the characteristics, attitudes and work patterns of students' school peer group. Any 'unobserved heterogeneity' in the study—work choices of students is captured by including a series of random individual effects α_{i}^{j} in the multinomial choice model specification. Finally, we add a set of idiosyncratic error terms ε_{it}^{j} to capture any remaining state-specific variation at each time period t. These errors are assumed to follow a Type I extreme value distribution, and are distributed identically and independently from all observed characteristics and unobserved heterogeneity terms. The vectors β_{j} and η_{s}^{j} are parameters to be estimated. For identification purposes each of the parameters α_{i}^{1}, β_{1} and η^{1} are normalised to 0.

The student chooses the alternative which gives her the highest utility, so that (conditional on the random effect) the probability of her choosing alternative j is given by a multinomial function:

$$P_{t}^{s} = P\{y_{it} = j \mid \alpha_{i}\} = \frac{\exp(\sum_{s=2}^{J} \eta_{s}^{j} D_{t-1}^{s} + \beta_{j} X_{it} + \alpha_{i}^{j})}{\sum_{k=1}^{J} \exp(\sum_{s=2}^{J} \eta_{s}^{k} D_{t-1}^{s} + \beta_{k} X_{it} + \alpha_{i}^{k})} \qquad (3)$$

This specification defines a dynamic process and allows us to distinguish between the effect of the lagged dependent variables (D_{t-1}^{s}) and the unobserved characteristics (α_{i}).

Students' intention and enrolment to higher education

Students' intention to universities is modelled as a dynamic logit model:
Let Ted_{it}^{*} be the latent value of receiving tertiary education in each period, and given by

$$Ted_{it}^{*} = \varsigma Z_{it} + \sum_{s=2}^{J} \rho_s^j D_{t-1}^s + \theta_i + \varphi_{it} \quad (4)$$

where Z_{it} is a vector of explanatory variables at wave t and θ_i is the random effect (unobserved heterogeneity). The study and work choices in the previous period D^s_{t-1}*'s* enter the equation, in that they may affect the return of receiving tertiary education. φ_{it} is an i.i.d. error term with logistic distribution. ς and ρ are parameters to estimate. Thus the probability for student i in time t intends go to university is given by

$$P_t^v = \Pr\{Ted_{it} = 1 \mid \theta_i\} = P\{\varsigma Z_{it} + \sum_{s=2}^{J} \rho_s D_{t-1}^s + \theta_i\} \quad (5)$$

The probability of students' actual enrolment in universities in 2002 (wave 5) is similarly but separately specified with a logit model

$$P^e = \Pr\{Univ_i = 1 \mid \theta_i^e\} = P\{\varsigma^e Z_{i4} + \sum_{s=2}^{J} \rho_s^e D_3^s + \theta_i^e\}, \quad (6)$$

where ς^e, ρ^e, and θ^e_i are similarly defined as for (5) but are distinct parameters and random effects respectively.

Marginal effects

In multinomial models of the form used in this report, the signs of the parameters in each equation give an indication of the directions of the effects of the associating variables on the probability of the modelled outcomes. However, given the non-linear structure of the model, the magnitude of the effects (which varies across individuals) cannot be inferred directly from the parameter. The effects of the explanatory variables are usually summarised with marginal effects of each variable on the explained probability for some benchmark individuals (such as sample mean). The marginal effect on the probability, for example, of enrolling in a university, of an explanatory variable is the change in the probability for one unit change in that explanatory variable if it is continuous (for example, proportion of working students), or for the change between 0 and 1 if it is a dummy variable (for example, Indigenous dummy).

Specification of the random effect terms

The random effects, α_i^2, α_i^3 in Equation (2) and θ_i in Equation (4) are assumed to be a linear combination of three independent *N(0,1)*variables, that is, to follow a multivariate normal distribution as follows:

$$\Delta_i \equiv \begin{pmatrix} \alpha_i^2 \\ \alpha_i^3 \\ \theta_i \end{pmatrix} = A \times \omega_i \quad (7)$$

where ω_i is a vector of three independent standard normal variables, and A is a 3×3 lower triangular parameter matrix to be estimated.

Finally, the random effect in the enrolment equation (6) is specified as $\theta^e_i = m\theta_i$, where *m* is a parameter to be estimated.

Initial conditions

The issue of initial condition arises because the lagged dependent variables D^s_{t-1}'s appear as explanatory variables of the model. We deal with this problem in the same manner as in Heckman (1981a). For the first wave (*t = 1*), we specify static equations of study—work and intention towards universities, respectively. The two static equations have different parameters and are without D^s_{t-1}'s . As discussed in Gong, van Soest and Villagomez (2004), these equations can be seen as linear approximations to the reduced form with the lagged study—work choices replaced by their specifications according to the dynamic model for periods earlier than *t = 1*. This treatment may lead to inconsistent estimates when the length of the panel is short and if the approximation is poor. However, a number of studies, including Heckman (1981a), Hyslop (1999), and Chay and Hyslop (2000), show that, empirically, the bias induced by this procedure is quite small. For more discussions of alternative treatment of the initial condition problem, also see Wooldridge (2000, 2002).

To be specific, the 'utility' of study and work, U^j_{i1} (*j=1, 2, 3*), is specified as

$$U^j_{i1} = \beta^0_j X_{it} + \alpha^{0j}_i + \varepsilon^j_{i1} \tag{8}$$

where the variables and parameters are all similarly defined as for Equation (2). Thus, the probability for student *i* to choose alternative *j* in wave 1, given the random effects (and *X*'s) is given by

$$P^s_1 = P\{y_{i1} = j \mid \alpha^0_i\} = \frac{\exp(\beta^0_j X_{it} + \alpha^{0j}_i)}{\sum_{k=1}^{J} \exp(\beta^0_k X_{it} + \alpha^{0k}_i)} \tag{9}$$

The probability of students' intention to universities in wave 1 is also specified similarly against its dynamic counterpart Equation (5),

$$P^v_1 = \Pr\{Ted_{i1} = 1 \mid \theta^0_i\} = P\{\varsigma^0 Z_{it} + \theta^0_i\} \tag{10}$$

Random effects in the two reduced-form equations are assumed to be a linear function of their dynamic counterparts in the following way

$$\Delta^0_i \equiv \begin{pmatrix} \alpha^2_i \\ \alpha^3_i \\ \theta_i \end{pmatrix} = C\Delta_i = B\omega_i \tag{11}$$

Sample attrition

To overcome the attrition problem, an additional survival equation is specified. The probability of being observed in time t (Ot = 1) conditional on being observed at t-1 is given by a logit function

$$P^a_t = \Pr\{O_{it} = 1 \mid O_{it-1} = 1\} = \Phi\{\varsigma^o M_{it-1} + \sum_{s=1}^{J} \mu^{o,j}_s D^s_{t-1}\} \tag{12}$$

where M_{it-1} is a vector of explanatory variables at *t-1*.

Estimation

The model is estimated jointly using simulated maximum likelihood. Joint estimation, together with the specification, is an important technique for taking account of the various selection issues. Given the random effects, the likelihood is a product of all choice probabilities (including the propensity for a student observation to 'survive' in a particular wave):

$$L_i(\omega) = \prod_{t=1}^{4}(P_t^s P_t^v)P^e \prod_{t=2}^{5} P_t^a \quad (13)$$

Since random effects are not observed, the likelihood contribution for each student is given by the expected value of (13), after the random effects are 'integrated out':

$$L_i = \iiint L_i(\omega_i)\varphi(\omega_i)d\omega_{i1}d\omega_{i2}d\omega_{i3} \quad (14)$$

where φ(ωi) is the density function of ω. We use a smooth simulated maximum likelihood approach, in which the three-dimensional integral is replaced by a simulated mean: for each individual, we take R draws from the distribution of the error terms ω, and compute the average of the R likelihood values conditional on these draws. The integral in (14) is thus replaced by

$$L_i = \frac{1}{R}\sum_{q=1}^{R} L_i(\omega_i^q) \quad (15)$$

In this paper, we choose R = 30. The draws are taken from Halton sequences[15] using the procedure described in Train (2003). The estimator resulting from random independent draws is inconsistent for fixed R, but will be consistent as R tends to infinity with the number of observations of the sample.

Some individuals are missing from the 1999 wave but return to the survey in the subsequent wave. To make full use of information, these individuals are included in the analysis, but their probability contributions in wave 2 are 'integrated out'.

[15] The 'quasi-random' Halton draws are designed to provide better coverage than independent draws. Simulation can also be more efficient in terms of reduced simulation errors for a given number of draws. See discussions in, for example, Bhat (2001), Train (2003), Sandor and Train (2004).

Appendix B: Parameter estimates

Table B1 Parameter estimates: study and work (initial) equation

Variables	Boys				Girls			
	Intensive work		Some work		Intensive work		Some work	
Constant	-.894	(0.58)	.665	(1.16)	-.270	(0.13)	-.647	(1.20)
Indigenous	-.134	(0.17)	-.765*	(1.71)	-2.083	(0.09)	-.439	(0.85)
Born later than 1984	-.909	(0.01)	-2.246	(0.05)	-.851	(0.01)	-.636	(0.23)
Regional Australia	.263	(0.70)	.145	(1.04)	.073	(0.17)	.029	(0.21)
Rural Australia	.279	(0.74)	-.197	(1.27)	-.380	(0.71)	.029	(0.20)
Catholic school	-.146	(0.42)	.256*	(1.94)	-.154	(0.35)	-.136	(0.96)
Independent school	.103	(0.20)	.240	(1.34)	-.941	(1.20)	-.237	(1.41)
Born in non-Eng. Europe/L. America	.253	(0.17)	-.026	(0.04)	.606	(0.22)	-.769	(0.91)
Born in other non-Eng. countries	-.604	(0.30)	-.090	(0.18)	.497	(0.34)	-.371	(0.79)
Both parents born in non-Eng. country	-.889	(0.71)	-.715**	(2.78)	-.279	(0.26)	-.716**	(2.66)
Father educ: no qual. or Yr 12	.279	(0.47)	.182	(0.92)	-.570	(1.04)	-.005	(0.03)
Father educ: qual., no Yr 12	.006	(0.02)	.173	(1.26)	-.132	(0.33)	.124	(0.96)
Father educ: no qual., but Yr 12	-.596	(0.76)	-.221	(0.95)	-.768	(0.80)	-.008	(0.03)
Father educ: missing	1.169	(1.52)	.076	(0.18)	-.133	(0.11)	-.116	(0.31)
Mother educ: no qual. or Yr 12	1.241*	(1.80)	.038	(0.19)	-.658	(1.53)	.123	(0.70)
Mother educ: qual., no Yr 12	1.170	(1.48)	-.101	(0.47)	-.671	(0.76)	-.321	(1.32)
Mother educ: no qual., but Yr 12	1.217*	(1.84)	.068	(0.38)	-.315	(0.65)	.023	(0.14)
Mother educ: missing	-.286	(0.23)	-.033	(0.08)	-1.884	(1.02)	-.052	(0.11)
Migrated high sch. or later	-1.825	(0.03)	-2.675	(0.12)	-2.138	(0.07)	.032	(0.03)
Migrated during prim. sch.	-.310	(0.24)	-.187	(0.40)	-1.248	(0.73)	.110	(0.25)
Migrated before school	.169	(0.12)	.409	(0.91)	.395	(0.33)	.262	(0.68)
LOTE: European	1.593	(1.41)	.141	(0.36)	.071	(0.04)	.383	(0.87)
LOTE: Asian	1.404	(1.09)	-1.357**	(2.06)	.714	(0.45)	-.326	(0.66)
LOTE: Arab	1.026	(0.40)	-.172	(0.24)	-.956	(0.04)	-2.119	(0.08)
LOTE: other	-1.000	(0.03)	-.722	(0.25)	-1.069	(0.03)	.973	(0.90)
Self-assessed: Eng. above avg.	.112	(0.36)	.040	(0.36)	.122	(0.35)	.067	(0.60)
Self-assessed: maths above avg.	-.458	(1.33)	.170	(1.47)	.122	(0.34)	.092	(0.80)
1998 test score above avg.	-.696*	(1.87)	-.225*	(1.87)	-.458	(1.22)	.078	(0.65)
Prop. of students not working	-3.960**	(2.42)	-2.704**	(3.97)	-2.253	(1.01)	-1.712**	(2.73)
Prop. of students above avg. test score	.198	(0.14)	-.008	(0.02)	.422	(0.31)	.297	(0.66)
Prop. of student intend to go to university	-1.057	(0.73)	-.246	(0.50)	-1.972	(1.41)	.463	(0.94)
State dummies	Yes							

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the parentheses.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Table B2 Parameter estimates: enrolment intention (initial) equation

Variables	Boys		Girls	
Constant	-3.910**	(5.68)	-1.850**	(2.91)
Indigenous	-.871**	(2.02)	-.283	(0.65)
Born later than 1984	.723	(0.21)	.463	(0.22)
Regional Australia	-.147	(0.98)	-.092	(0.64)
Rural Australia	-.095	(0.60)	.141	(0.88)
Catholic school	.098	(0.68)	.251*	(1.65)
Independent school	-.192	(0.97)	.298	(1.45)
Born in non-Eng. Europe/L. America	-.026	(0.04)	.390	(0.53)
Born in other non-Eng. countries	.498	(0.99)	.755	(1.60)
Both parents born in non-Eng. country	.978**	(4.42)	.682**	(2.61)
Father educ: no qual. or Yr 12	-.679**	(3.50)	-.296	(1.43)
Father educ: qual., no Yr 12	-.557**	(3.94)	-.382**	(2.76)
Father educ: no qual., but Yr 12	.241	(1.12)	.066	(0.26)
Father educ: missing	-.096	(0.23)	-.690**	(2.23)
Mother educ: no qual. or Yr 12	.037	(0.19)	-.093	(0.52)
Mother educ: qual., no Yr 12	-.423**	(2.05)	.072	(0.30)
Mother educ: no qual., but Yr 12	.065	(0.38)	.210	(1.22)
Mother educ: missing	-1.182**	(2.64)	.285	(0.75)
Migrants: arrival high school or later	-.732	(1.11)	.283	(0.40)
Migrants: arrival during primary school	-.320	(0.72)	.118	(0.27)
Migrants: arrival before school	.016	(0.03)	.436	(1.08)
LOTE: European	-.126	(0.35)	-.754*	(1.71)
LOTE: Asian	-.230	(0.51)	-.231	(0.50)
LOTE: Arab	.391	(0.61)	.845	(0.99)
LOTE: other	.277	(0.27)	-.628	(0.75)
Self-assessment: English above average	.879**	(7.88)	.981**	(7.93)
Self-assessment: maths above average	.667**	(5.82)	.925**	(7.37)
1998 test score above average	1.006**	(8.24)	.934**	(7.43)
Prop. of students not working	.407	(0.59)	.536	(0.84)
Prop. of students above avg. test score	.559	(1.17)	2.097**	(3.88)
Prop. of students intending to go to university	2.047**	(3.92)	1.146**	(2.14)
Prop. of students' fathers having qual. and Yr 12	1.752**	(2.85)	-.573	(0.90)
Prop. of students' mothers having qual. and Yr 12	-.348	(0.55)	.211	(0.31)
Prop. of students finish homework	-.317	(0.63)	.419	(0.82)
Prop. of students think mates eager to learn	0.927	(1.46)	-.006	(0.01)
Prop. of students think mates work hard	-1.041*	(1.66)	.768	(1.19)
Prop. of students think mates well behaved	.161	(0.31)	-.662	(1.20)
Prop. of students think teachers qualified	.460	(0.82)	-.728	(1.42)
State dummies	Yes			

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the parentheses.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Table B3 Parameter estimates: study and work (dynamic) equation

Variables	Boys				Girls			
	Intensive		Some		Intensive		Some	
Constant	.357	(1.03)	.305	(1.14)	-.003	(0.01)	.630**	(2.72)
Indigenous	-.143	(0.43)	-.453*	(1.73)	-.685	(1.55)	-.766**	(2.55)
Born later than 1984	-.121	(0.03)	-.424	(0.14)	-1.189	(0.49)	-1.438	(0.76)
Regional Australia	-.018	(0.14)	-.042	(0.43)	-.192	(1.57)	.001	(0.01)
Rural Australia	-.176	(1.30)	-.016	(0.15)	-.196	(1.52)	-.112	(1.24)
Catholic school	-.076	(0.57)	.112	(1.22)	-.240*	(1.77)	.031	(0.35)
Independent school	.174	(0.97)	-.076	(0.63)	-.606**	(3.27)	-.353**	(3.27)
Born: non-Eng. Europe/L. America	-.355	(0.64)	-.279	(0.66)	-.718	(1.00)	.182	(0.47)
Born: other non-Eng. countries	-.398	(0.78)	-.249	(0.79)	.218	(0.51)	-.025	(0.09)
Parents born in non-Eng. country	-.624**	(2.60)	-.479**	(3.10)	-.691**	(2.82)	-.407**	(2.98)
Father educ: no qual. or Yr 12	.098	(0.56)	-.292**	(2.12)	.326*	(1.90)	.077	(0.64)
Father educ: qual., no Yr 12	.481**	(3.63)	-.039	(0.40)	.518**	(4.24)	.256**	(3.10)
Father educ: no qual., but Yr 12	.188	(0.88)	.021	(0.14)	.041	(0.19)	-.237	(1.60)
Father educ: missing	-.261	(0.78)	-.204	(0.67)	-.054	(0.21)	-.227	(1.12)
Mother educ: no qual. or Yr 12	-.102	(0.60)	-.108	(0.83)	.127	(0.86)	.113	(1.07)
Mother educ: qual., no Yr 12	.051	(0.26)	-.101	(0.72)	.123	(0.62)	.176	(1.28)
Mother educ: no qual., but Yr 12	-.106	(0.68)	-.073	(0.61)	-.057	(0.39)	.139	(1.37)
Mother educ: missing	.605*	(1.68)	.063	(0.20)	.345	(1.09)	.171	(0.71)
Migrated high school or later	-.185	(0.16)	-.463	(0.82)	.589	(0.92)	-.587	(1.29)
Migrated during primary school	-.089	(0.23)	-.021	(0.07)	-.249	(0.64)	-.271	(1.04)
Migrated before school	.175	(0.36)	.183	(0.61)	-.458	(1.11)	-.391	(1.55)
LOTE: European	.326	(0.91)	.003	(0.01)	.306	(0.89)	-.165	(0.71)
LOTE: Asian	-.804*	(1.76)	-.653**	(2.29)	-1.303**	(2.69)	-1.046**	(4.06)
LOTE: Arab	.105	(0.15)	-.513	(1.07)	-.455	(0.54)	-1.098	(1.60)
LOTE: other	.448	(0.46)	-1.043	(0.85)	.373	(0.30)	-.103	(0.15)
Self-assessed Eng. above avg.	-.224**	(2.11)	.120	(1.59)	-.140	(1.35)	.065	(0.96)
Self-assessed maths above avg.	-.367**	(3.38)	-.047	(0.61)	-.134	(1.27)	.155**	(2.28)
Same school as in 1998	-.318*	(1.88)	-.226*	(1.86)	-.134	(0.82)	-.052	(0.47)
1998 test score above avg.	-.455**	(4.00)	-.066	(0.82)	-.198*	(1.94)	.057	(0.81)
Prop. of students not working	-3.859**	(9.82)	-2.890**	(9.96)	-3.173**	(8.27)	-2.904**	(11.2)
Prop. of students above avg. score	-.043	(0.11)	-.104	(0.36)	-.324	(0.82)	-.180	(0.70)
Prop. of student intend for univ.	-1.442**	(3.90)	.598**	(2.22)	-1.237**	(3.51)	.338	(1.38)
Work intensively in previous year	2.170**	(10.65)	1.177**	(6.94)	2.510**	(12.58)	1.208**	(7.21)
Some work in previous year	.750**	(5.32)	1.593**	(14.60)	1.340**	(10.61)	1.606**	(15.96)
State dummies	Yes							

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the parentheses.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Table B4 Parameter estimates: enrolment intention (dynamic) equation

Variables	Boys		Female	
Constant	-5.797**	(10.7)	-2.879**	(6.43)
Indigenous	-.637	(1.37)	-.259	(0.60)
Born later than 1984	-.007	(0.00)	2.087	(0.82)
Regional Australia	.159	(0.96)	.020	(0.14)
Rural Australia	.089	(0.52)	.306*	(1.93)
Catholic school	.320**	(2.01)	.271*	(1.95)
Independent school	-.018	(0.09)	.210	(1.15)
Born in non-Eng. Europe/L. America	-.505	(0.72)	.823	(1.28)
Born in other non-Eng. countries	.059	(0.11)	.110	(0.24)
Both parents born in non-Eng. country	.954**	(3.62)	1.216**	(4.63)
Father educ: no qual. or Yr 12	-.688**	(3.12)	-.601**	(2.98)
Father educ: qual., no Yr 12	-.691**	(4.47)	-.480**	(3.50)
Father educ: no qual., but Yr 12	.270	(1.05)	-.008	(0.03)
Father educ: missing	-.677	(1.35)	-1.122**	(3.70)
Mother educ: no qual. or Yr 12	-.366*	(1.69)	-.266	(1.50)
Mother educ: qual., no Yr 12	-.829**	(3.66)	-.346	(1.48)
Mother educ: no qual., but Yr 12	-.079	(0.40)	.313*	(1.86)
Mother educ: missing	-1.086**	(1.99)	.081	(0.22)
Migrants: arrival high school or later	-.275	(0.31)	-.052	(0.07)
Migrants: arrival during primary school	.388	(0.84)	-.075	(0.19)
Migrants: arrival before school	-.191	(0.37)	.285	(0.67)
LOTE: European	-.063	(0.15)	-.805*	(1.95)
LOTE: Asian	1.582**	(3.12)	1.255**	(2.58)
LOTE: Arab	.853	(1.16)	-.409	(0.47)
LOTE: other	.476	(0.28)	.582	(0.52)
Self-assessed: English above average	1.205**	(9.41)	1.190**	(10.36)
Self-assessed: maths above average	1.075**	(8.27)	.886**	(7.53)
Same school as in 1998	-.112	(0.71)	.214	(1.54)
1998 test score above average	1.669**	(12.18)	1.129**	(9.52)
Prop. of students not working work	.731*	(1.95)	.026	(0.08)
Prop. of students above avg. test score	-.153	(0.32)	-.255	(0.54)
Prop. of students intend to go to university	4.326**	(11.58)	4.863**	(13.65)
Prop. of students' father having qual. and Yr 12	1.119	(1.63)	-1.386**	(2.27)
Prop. of students' mother having qual. and Yr 12	.181	(0.25)	1.347**	(2.11)
Prop. of students finish homework	-1.346**	(2.33)	-.421	(0.85)
Prop. of students think mates eager to learn	.331	(0.50)	-.320	(0.52)
Prop. of students think mates work hard	.464	(0.67)	-.027	(0.04)
Prop. of students think mates well behaved	-1.048*	(1.73)	-.157	(0.29)
Prop. of students think teachers qualified	.622	(1.02)	-.685	(1.40)
Work intensively in previous year	-.239	(1.11)	.157	(0.83)
Some work in previous year	.154	(1.32)	.036	(0.36)
State dummies	Yes			

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the parentheses.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Table B5 Parameter estimates: enrolment equation

Variables	Boys		Girls	
Constant	-7.819**	(9.75)	-4.939**	(6.87)
Indigenous	-1.420**	(2.33)	-0.977	(1.21)
Born later than 1984	-.430	(0.16)	3.338	(0.18)
Regional Australia	.130	(0.56)	0.096	(0.44)
Rural Australia	.555**	(2.29)	0.654**	(2.65)
Catholic school	.318	(1.46)	0.425*	(1.94)
Independent school	.183	(0.60)	0.138	(0.47)
Born in non-Eng. Europe/L. America	-.324	(0.37)	-0.561	(0.62)
Born in other non-Eng. countries	.749	(1.07)	-0.387	(0.62)
Both parents born in non-Eng. country	.932**	(2.67)	0.889**	(2.37)
Father educ: no qual. or Yr 12	-1.002**	(3.35)	-0.989**	(3.37)
Father educ: qual., no Yr 12	-.675**	(3.08)	-0.524**	(2.57)
Father educ: no qual., but Yr 12	-.185	(0.58)	-0.538	(1.50)
Father educ: missing	-1.540**	(2.30)	-1.071**	(2.22)
Mother educ: no qual. or Yr 12	-.542*	(1.88)	-0.374	(1.44)
Mother educ: qual., no Yr 12	-.587*	(1.87)	-0.345	(1.00)
Mother educ: no qual., but Yr 12	.186	(0.73)	0.351	(1.41)
Mother educ: missing	-.388	(0.50)	-0.284	(0.48)
Migrants: arrival high school or later	.385	(0.26)	-0.433	(0.49)
Migrants: arrival during primary sch.	-.751	(1.23)	0.822	(1.37)
Migrants: arrival before school	-1.257*	(1.90)	0.650	(1.13)
LOTE: European	.028	(0.04)	-0.638	(0.98)
LOTE: Asian	.970	(1.59)	0.715	(1.21)
LOTE: Arab	-.127	(0.14)	-1.884	(1.54)
LOTE: other	.273	(0.25)	-0.004	(0.00)
Self-assessed: English above average	1.286**	(7.16)	1.263**	(7.23)
Self-assessed: maths above average	1.419**	(7.62)	1.479**	(8.11)
Same school as in 1998	-.517**	(2.34)	0.165	(0.79)
1998 test score above average	2.016**	(9.95)	1.710**	(9.15)
Proportion of students not working	.245	(0.38)	-0.448	(0.71)
Prop. of students above average test score	.857	(1.16)	0.132	(0.17)
Prop. of students intend to go to university	3.048**	(4.30)	3.420**	(5.06)
Prop. of students' father having qual. and Yr 12	.526	(0.49)	0.638	(0.63)
Prop. of students' mother having qual. and Yr 12	2.691**	(2.47)	1.587	(1.51)
Prop. of students finish homework	.005	(0.01)	-1.224	(1.48)
Prop. of students think mates eager to learn	1.757	(1.60)	1.052	(1.03)
Prop. of students think mates work hard	.821	(0.81)	-0.645	(0.65)
Prop. of students think mates well behaved	-1.723*	(1.89)	0.222	(0.25)
Prop. of students think teachers qualified	0.476	(0.55)	0.374	(0.44)
Work intensively in previous year	.734**	(2.68)	-.844**	(3.12)
Some work in previous year	.350**	(2.10)	.100	(0.61)
State dummies	Yes			

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the parentheses.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Table B6 Attrition equation

Variables	Boys		Girls	
Constant	-.074	(0.15)	1.501**	(3.23)
Indigenous	-.091	(0.24)	.169	(0.35)
Born later than 1984	1.187	(0.02)	-.614	(0.67)
Regional Australia	.405**	(2.45)	-.021	(0.13)
Rural Australia	.134	(0.82)	-.032	(0.18)
Catholic school	-.033	(0.18)	.364**	(2.20)
Independent school	-.401	(1.52)	-.142	(0.63)
Born in non-Eng. Europe/L. America	1.240	(1.46)	.506	(0.73)
Born in other non-Eng. countries	-.488	(1.05)	.613	(1.44)
Both parents born in non-Eng. country	-.173	(0.67)	.393	(1.25)
Father educ: no qual. or Yr 12	-.009	(0.04)	-.351	(1.60)
Father educ: qual., no Yr 12	-.023	(0.15)	-.241	(1.59)
Father educ: no qual., but Yr 12	-.011	(0.04)	-.236	(0.86)
Father educ: missing	-.273	(0.67)	-.448	(1.22)
Mother educ: no qual. or Yr 12	-.107	(0.53)	-.103	(0.50)
Mother educ: qual., no Yr 12	.157	(0.63)	-.051	(0.20)
Mother educ: no qual., but Yr 12	.141	(0.71)	-.167	(0.90)
Mother educ: missing	.532	(1.11)	-.204	(0.47)
Migrants: arrival high school or later	-.887	(1.43)	-1.479**	(2.73)
Migrants: arrival during primary school	-.081	(0.20)	-1.367**	(4.28)
Migrants: arrival before school	-.246	(0.47)	-.404	(0.99)
LOTE: European	-.220	(0.60)	-.235	(0.45)
LOTE: Asian	.385	(0.80)	-.494	(1.11)
LOTE: Arab	.118	(0.19)	.244	(0.21)
LOTE: other	-.452	(0.52)	-.324	(0.39)
Self-assessed: English above average	.176	(1.35)	-.043	(0.34)
Self-assessed: maths above average	.238*	(1.88)	.178	(1.38)
Same school as in 1998	-.469**	(2.59)	-.297*	(1.70)
1998 test score above average	.171	(1.24)	.363**	(2.81)
Proportion of students not working	4.872**	(10.41)	4.981**	(11.46)
Proportion of students above avg. test score	.746	(1.39)	-.449	(0.79)
Proportion of student intend to go to univ.	-.948**	(2.27)	-1.401**	(3.08)
Proportion of students' fathers having qual. and Yr 12	-.892	(1.25)	-.775	(1.10)
Proportion of students' mothers having qual. and Yr 12	1.367	(1.63)	1.040	(1.41)
Proportion of students finish homework	-.177	(0.28)	-.291	(0.51)
Proportion of students think mates eager to learn	-.547	(0.72)	-1.040	(1.42)
Proportion of students think mates work hard	1.466*	(1.93)	1.135	(1.63)
Proportion of students think mates well behaved	-.531	(0.81)	-.562	(0.87)
Proportion of students think teachers qualified	.441	(0.70)	.947	(1.62)
Intend to go to university in previous year	.655**	(4.33)	.477**	(3.39)
Likelihood ratio test that the slopes are jointly 0	Reject		Reject	
State dummies	Yes			

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the parentheses. Likelihood ratio tests show that parameters are jointly significant for both equations.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Table B6A Marginal effects on probabilities of remaining in the sample

Variables	Male		Female	
Indigenous	-.001	(0.24)	.006	(0.35)
Born later than 1984	.018	(0.02)	-.021	(0.64)
Regional Australia	.006*	(1.69)	-.001	(0.13)
Rural Australia	.002	(0.76)	-.001	(0.18)
Catholic school	.000	(0.19)	.013	(1.41)
Independent school	-.006*	(1.67)	-.005	(0.70)
Born in non-Eng. Europe/Latin America	.019	(1.18)	.018	(0.69)
Born in other non-Eng. countries	-.007	(0.94)	.021	(1.15)
Both parents born in non-Eng. country	-.003	(0.65)	.014	(1.08)
Father educ: no qual. or Yr 12	.000	(0.04)	-.012	(1.27)
Father educ: qual., no Yr 12	.000	(0.15)	-.008	(1.22)
Father educ: no qual., but Yr 12	.000	(0.04)	-.008	(0.78)
Father educ: missing	-.004	(0.63)	-.016	(1.04)
Mother educ: no qual. or Yr 12	-.002	(0.52)	-.004	(0.49)
Mother educ: qual., no Yr 12	.002	(0.61)	-.002	(0.20)
Mother educ: no qual., but Yr 12	.002	(0.66)	-.006	(0.85)
Mother educ: missing	.008	(0.99)	-.007	(0.47)
Migrants: arrival high school or later	-.013	(1.17)	-.051*	(1.65)
Migrants: arrival during primary school	-.001	(0.20)	-.047*	(1.89)
Migrants: arrival before school	-.004	(0.46)	-.014	(0.89)
LOTE: European	-.003	(0.57)	-.008	(0.44)
LOTE: Asian	.006	(0.75)	-.017	(0.99)
LOTE: Arab	.002	(0.19)	.008	(0.21)
LOTE: other	-.007	(0.50)	-.011	(0.39)
Self-assessed: English above average	.003	(1.07)	-.001	(0.34)
Self-assessed: maths above average	.004	(1.34)	.006	(1.16)
Same school as in 1998	-.007	(1.46)	-.010	(1.15)
1998 test score above average	.003	(1.10)	.013*	(1.78)
Proportion of students not working	.073**	(2.20)	.173**	(2.26)
Proportion of students above average test score	.011	(1.11)	-.016	(0.76)
Proportion of student intending to go to university	-.014	(1.48)	-.049*	(1.79)
Proportion of fathers having qual. and Year 12	-.013	(1.11)	-.027	(1.00)
Proportion of mothers having qual. and Year 12	.020	(1.41)	.036	(1.28)
Proportion of students finish homework	-.003	(0.27)	-.010	(0.49)
Proportion of students think mates eager to learn	-.008	(0.65)	-.036	(1.08)
Proportion of students think mates working hard	.022	(1.52)	.039	(1.42)
Proportion of students think mates well behaved	-.008	(0.77)	-.020	(0.85)
Proportion of students think teachers qualified	.007	(0.72)	.033*	(1.65)
Intend to go to university in previous year	.010**	(1.96)	.017**	(1.97)
State dummies	No			

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the brackets.
LOTE = language other than English.

Source: Authors' calculation based upon LSAY 1998.

Table B7 Parameter estimates: variance and co-variances estimates of the random effects

	Boys				Girls			
	In initial equations (Δ^0)		In dynamic equations (Δ)		In initial equations (Δ^0)		In dynamic equations (Δ)	
σ_3^2	1.984	(4.68)**	1.000**	(2.12)	1.239	(3.75)**	0.841	(1.37)
σ_{23}	1.262**	(5.12)	0.858**	(3.48)	0.880**	(4.32)	0.578**	(2.35)
σ_2^2	0.975**	(4.45)	0.756**	(3.84)	0.795**	(4.19)	0.484**	(2.95)
$\sigma_{3\theta}$	1.490**	(8.10)	-0.573**	(3.68)	-0.929**	(6.79)	-0.428**	(2.43)
$\sigma_{2\theta}$	0.056	(0.45)	-0.352**	(3.48)	0.200**	(2.00)	0.066	(0.63)
σ_θ^2	5.775**	(12.70)	1.400**	(6.07)	5.032**	(13.70)	1.871**	(4.12)
σ_e^2	1.198**	(4.04)			2.191**	(3.41)		
Likelihood:	-6 215				Likelihood:	-6 942		
Number of obs:	18 340 (of 5 380 individuals)				Number of obs:	19 444 (of 5 324 individuals)		

Notes: * Significant at 10% level; ** Significant at 5% level; *t*-values are in the parentheses.

Source: Authors' calculation based upon LSAY 1998.

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